

- January 13. 10h. 1m. Minimum of Algol (β Persei).
 15. Venus. Illuminated portion of disc = 0.873.
 16. 6h. 50m. Minimum of Algol (β Persei).
 16. 17h. 17m. to 17h. 50m. Occultation of α Cancri (mag. 4.3) by the moon.
 20. 12h. 46m. to 13h. 46m. Occultation of B.A.C. 4006 (mag. 5.7) by the moon.
 21. 11h. 22m. to 12h. 26m. Occultation of γ Virginis (mag. 5.7) by the moon.
 23. 15h. 35m. to 16h. 45m. Occultation of B.A.C. 4722 (mag. 5.5).
 26. 1h. Conjunction of Jupiter and the moon (Jupiter $2' 3''$ N.).
 26. 15h. 40m. Transit of Jupiter's Sat. III. (Egress).

ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.

—Prof. E. B. Frost, of the Yerkes Observatory, contributes to *Science* a full account of the proceedings at the first meeting of this new society, which is the permanent outcome of the two congresses of astronomers and astrophysicists held in the past two years. The following notes are from the report:—

Prof. S. J. Brown discussed his measures of the changes in the orbit of the satellite of Neptune, in order to determine the position of the polar axis and flattening of the planet. This flattening is found to be $e = \frac{1}{102.2}$, an amount corresponding

to only 0".03 between the polar and equatorial diameters.

The period of the revolution of the pole of the satellite's orbit is 531.75 years.

Prof. A. S. Flint described the new Repsold transit micrometer of the Washburn Observatory.

Mr. Kurt Laves read a paper on the "Determination of the constant of nutation from heliometer measures of Eros." The opposition of this planet at the end of 1900 will offer special facilities for this purpose.

An account was given of a proposed new "Harvard Photometry." In the original work all stars were included of sixth or brighter magnitude, as obtained from the principal catalogues then extant; but it has been found in the course of the work that in this way many have been included which are fainter than mag. 6.2. The stars of the Photometry were again observed in 1892-94, and, including special series of measures, there are now prepared seven photometric catalogues, giving measures by different observers with different instruments, but all made on the same plan. It is therefore proposed to issue a catalogue of all the stars from the north to the south pole, showing the brightness given by the meridian photometer in all seven catalogues, and to call the work the "Revised Harvard Photometry." As much reference information to other catalogues will be given as is possible, and it is thought a quantitative measure of the colour will be furnished by giving the type of spectrum and photographic magnitude.

Prof. G. C. Comstock described his experiments of placing a very coarse grating before the object glass of a telescope, and measuring the distance between the mean centres of the pairs of star spectra formed on each side of the central image. He finds incidentally that the mean refrangibility of the light of Mars is marked by less than that of any red stars yet examined. He has also examined the satellites of Jupiter in this way, and finds different values from those adopted by Michelson and Hamy.

Mr. F. L. Chase has taken heliometer observations of red stars, &c., in order to determine the possibility of there being a slight difference of refraction between these and white stars, thus introducing a disturbing element into measures of parallax. In all his experience, however, he was unable to detect any difference whatever.

Prof. S. I. Bailey said that out of the 900 stars counted in the cluster M. 5., eighty-five were variable. Detailed examination of the light curves and periods of many of them showed a remarkable similarity both in the magnitude and range of variation. The periods vary from 10h. 48m. to 14h. 59m. The uniformity of period, magnitude, and light curve among so many variables, points to a common origin and cause of variability.

DAY NUMBERS OF "NAUTICAL ALMANAC."—We have received a pamphlet giving the separate day numbers for use with the tables for finding star constants for the years 1900, 1901, 1902. From the past three years' experience, Prof. Turner says that his restriction of the tables to three figures has been

followed by no loss of accuracy, and therefore their publication is continued. In accordance with the decisions of the Conference of Superintendents of Ephemerides held at Paris in 1896, the constants of aberration, precession, and nutation have been altered from the commencement of 1901; but, for the convenience of observers still desiring to use the Struve-Peter's constants, both have been included in the present tables.

"POPULAR ASTRONOMY" FOR DECEMBER.—The issue of *Popular Astronomy* for this month contains, among much generally interesting matter, two useful articles by Profs. H. C. Wilson and W. H. Pickering. The former describes a photograph of the nebula of Andromeda obtained by him at Goodsell Observatory, using the 8-inch Clarke refractor, with an exposure of twelve hours given on three nights. Reproductions of the picture accompany the paper, and the minute structure of the many spirals first photographed by Roberts are magnificently shown.

Prof. Pickering writes to keep up hopes of the meteor shower still being observable. He has examined the times of appearance of the maximum from 902 more minutely, and finds they occurred at regular 100 years' intervals until 1698, when there was a perturbation of four years. Since then thirty-four years would appear to more closely satisfy the period, so that 1901-2 may still be the maximum year.

THE SOUTH-WESTERN POLYTECHNIC.

ONE of the best equipped and most intelligently governed of the London polytechnics is that built at a cost of 55,000*l.*, and located at Manresa Road, Chelsea. Situated as it is in the midst of a densely-populated district, its work, which a large staff of lecturers and demonstrators, under the able guidance of Prof. H. Tomlinson, F.R.S., the Principal, are year by year steadily accomplishing, cannot be overestimated. The work of the polytechnic is carried on in a fine suite of buildings placed within a stone's throw of the Chelsea Town Hall, and the institution is provided with laboratories and lecture-rooms for each of the many departments of science and technology which its work comprises. It is designed more especially to meet the educational needs of the inhabitants of Chelsea, Fulham, Kensington, St. George's (Hanover Square), and Westminster, though students from other parishes are admitted if accommodation is available and other circumstances permit.

Financial Position.—The financial outlook of the South-Western Polytechnic may certainly be regarded as hopeful. Both the fees received from the students and members and the grants earned last session from the Science and Art Department showed a very large increase. The total annual income received from the Technical Education Board of the London County Council amounts to over 4000*l.*, and the annual subsidy from the Charity Commissioners is 1500*l.* The inadequate accommodation which the already extensive buildings offer the increasing number of students to be provided for, has necessitated a further extension, and the governing body are now spending some 7000*l.* on new buildings.

Departments.—The operations of the institution are divided into two distinct portions—day classes and evening classes. In the day classes are included (1) a Day College for men; (2) a Day College for women; (3) a School of Art; (4) a School of Science for boys and girls; and (5) a School of Domestic Economy for girls. The evening classes embrace the following sections: (1) Mathematics; (2) Physics and Electrical Engineering; (3) Mechanical Engineering and Building Trades; (4) Chemistry; (5) Natural Sciences; (6) Languages; (7) Commerce; (8) Domestic Economy; (9) Art; (10) Music; (11) Miscellaneous; (12) Recreation.

Numbers of Students.—The most notable fact, and one of the most encouraging features of the work of the South-Western Polytechnic, is the regular and substantial increase from year to year in the numbers of students attending the different departments. The number of students in the day classes during the session 1897-8 was nearly half as many again as that during 1896-7. Taking all the day classes for both sexes together, the number of individuals attending during the present session is about 30 per cent. greater than for the last school year, the number undergoing instruction at the present time being about 900.

The number of individual students in all evening classes together is about 2000 for the current session, during 1897-8 it

was 1844, and the preceding year, 1896-7, 1520. The relative popularity of the different departments among evening class students can be seen at a glance from the number of class entries during the session 1897-8, which was as follows:—

Mathematics	85
Physics and Electrical Engineering...	578
Mechanical Engineering and Building Trades	942
Chemistry	185
Natural Sciences	137
Languages	246
Commerce	342
Domestic Economy	233
Art	287
Music	455
Gymnastics	306
Miscellaneous	233

The trades and industries of the evening class students show great variety, and indicate graphically the widespread influence

he wishes to be trained as a mechanical or electrical engineer, whether he wishes to be educated with a view to some branch of chemical industry or of the building trade, or whether he desires to study applied art. Except in the last contingency, complete courses of study have been arranged, involving laboratory instruction, tutorial work, attendance at lectures, mathematical exercises, drawing, and workshop instruction.

The general department of the day college, on the other hand, aims at giving either a good all-round education or special training in each of its various sections.

Students admitted to a regular and fully prescribed course of study in the technical department are first required to pass an elementary examination in mathematics and to give evidence of possessing a fair knowledge of English. In the general department the students are not required to pass any entrance examination. Students in the technical department who successfully work through the second year's course may compete for a college diploma.

A few words about the different courses of instruction in the

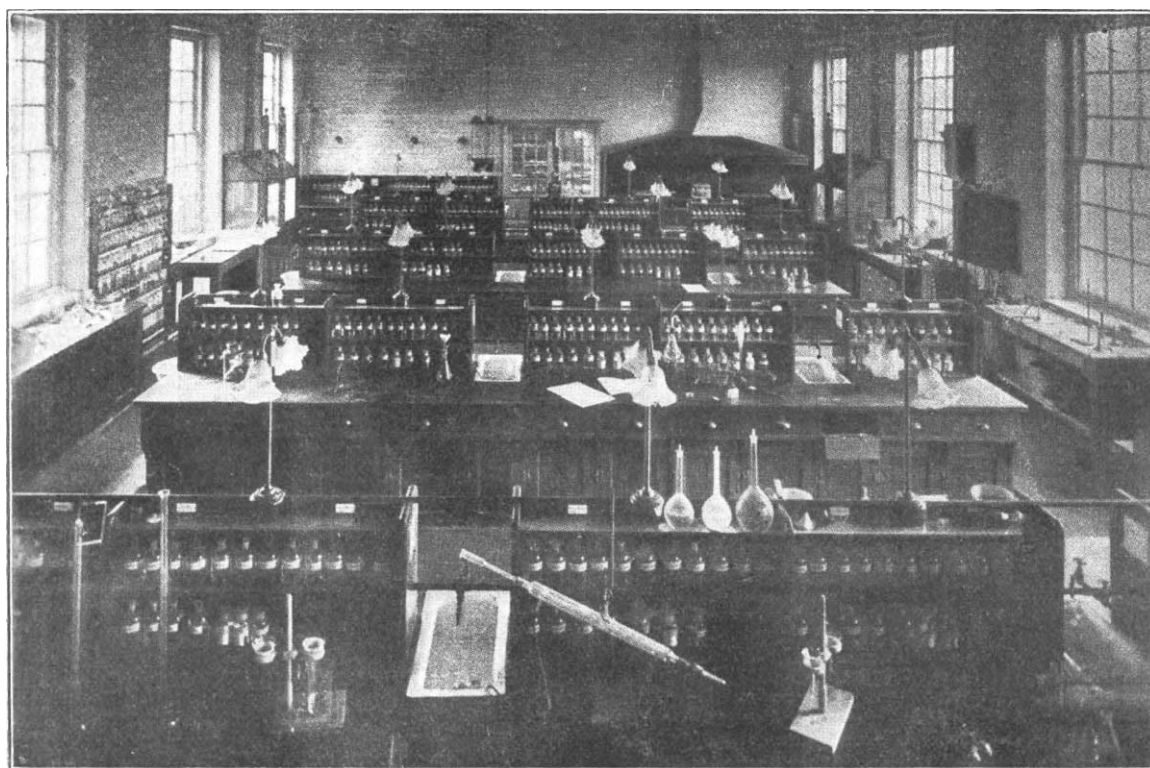


FIG. 1.—The Chemical Laboratory, South-Western Polytechnic.

which a polytechnic is able to exert. Of the 1844 students attending evening classes during 1897-8, 304 were clerks, 192 teachers of one kind or another, 183 were salesmen and shop-assistants, 175 apprentices, 65 servants, 59 carpenters and joiners, 42 artists, 37 electricians, 37 painters, 34 builders' clerks, 32 civil servants, and 31 telegraphists. In addition to these, rather smaller numbers of bricklayers, plumbers, fitters, engineers, draughtsmen, dressmakers, milliners were in attendance, while doctors, architects, and merchants were represented; one or two postmen, porters, and others were also reaping the benefits of education.

DAY COLLEGE FOR MEN.

This college is intended for males above the age of fifteen, and is at the present time attended by over a hundred students, whose ages range from fifteen to forty. It comprises two departments—one technical, the other general. The courses of instruction in the former are arranged to occupy at least two years. On entering, the student is expected to state whether

technical department will best indicate the nature or the work in this part of the day college for men. The full scheme of work is:—

(a) *The Mechanical Engineering and Architecture Section* is spread over two years, and aims at providing progressive instruction of a theoretical and practical nature, suitable for students just leaving school and who intend in the near future entering the works of an engineer or the office of an architect. At the same time it is designed to be of service to those who have already spent three or more years in a workshop, and who require a course of technical instruction to fit them for positions of greater responsibility.

(b) *The Civil Engineering and Surveying Section* also takes up two years, and trains young men who will hereafter be engaged in surveying, civil engineering, constructional work of any kind, or who propose to proceed to the colonies.

(c) *The Electrical Engineering and Applied Physics Section* is intended to familiarise students with methods of accurate measurement and observation, as well as to give a sound know-

ledge of physical laws and their application to industrial and engineering operations. The laboratories are capable of accommodating fifty students at one time, and are equipped throughout with the most recent apparatus for the study of physics.

(d) *The Chemistry Section* is arranged to assist students who intend carrying on work involving the applications of chemistry as industrial, consulting, or analytical chemists. The course includes other subjects required by technical chemists, and students who wish to do more advanced work can only complete the course in three years.

DAY COLLEGE FOR WOMEN.

This college is the counterpart of the day college for men, and the Principal is aided in its direction by a lady superintendent. It is at the present time attended by 200 students. The aim of the college is to provide women with a thorough and liberal education, not only in art, science, literature, and commerce, but also in domestic economy and physical training. While it is a little

theoretical, and the most careful precautions are taken to ensure the physical well-being of the embryo instructors.

EVENING CLASSES.

The time table of the evening classes at this polytechnic gives the impression that it would be difficult to name a subject which is not included. There are classes in all branches of pure and applied science, languages and literature, domestic science, commercial subjects, art, music, and many other subjects. The fees are low, and the classes well attended, while the examination results show that the students make substantial progress.

HIGHER SCIENTIFIC INSTRUCTION AND WORK IN RESEARCH.

A special characteristic of the work of the South-Western Polytechnic is the higher instruction in science and the interesting development of education in the methods of research, to which reference has already been made in these columns (No. 1523, p. 236). Both in the day and evening classes great attention is given to electrical engineering. The following table shows the

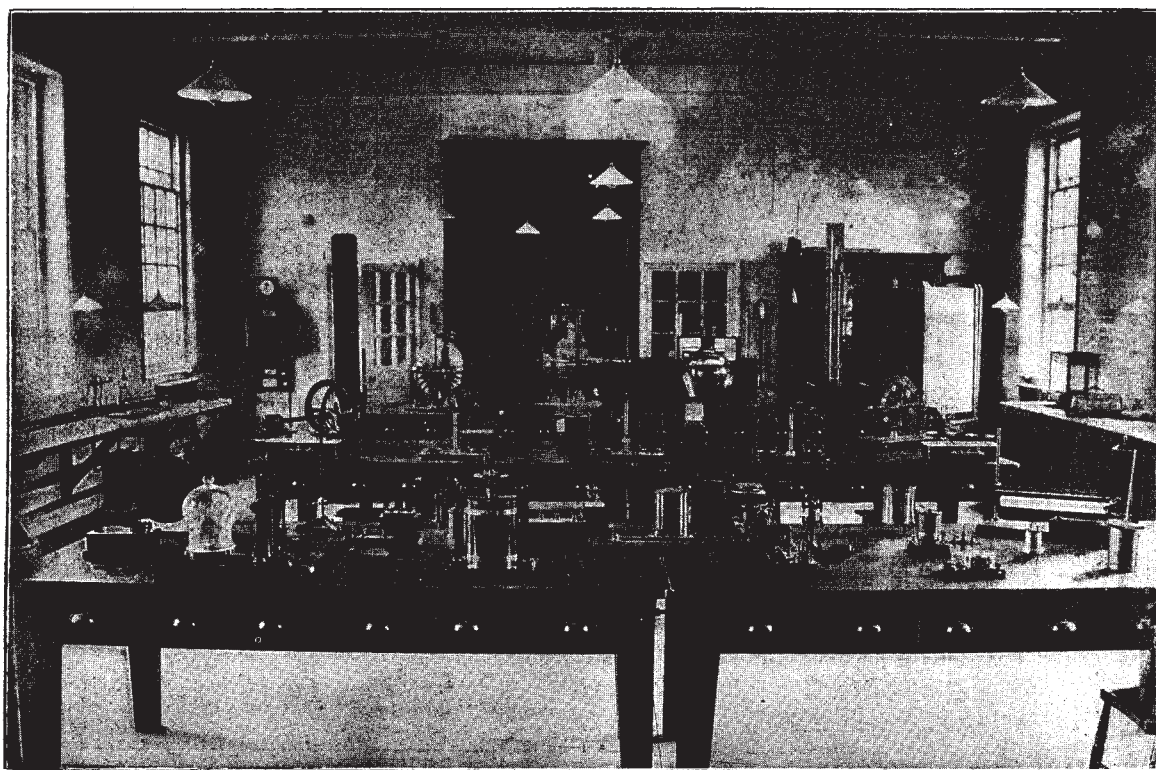


FIG. 2.—The Physical Laboratory, South-Western Polytechnic.

difficult to make selections where the whole work is so satisfactory, the training offered for lady secretaries and the training college for gymnastic teachers call for special mention. The growing demand for ladies to act as secretaries or confidential clerks renders the question of the competent training of candidates for such posts one of great practical importance, and there is no doubt that the arrangements which have been made at Chelsea to provide a complete course of study for those wishing to obtain employment as secretaries or clerks will have a very beneficial effect.

The training college for gymnastic teachers is under the direction of Fräulein Wilke. The complete course of training extends over two years, and the fee for the whole time is seventy-two guineas. A noteworthy feature of the method of instruction adopted is that the candidates are taught each of the systems of gymnastics, German, Swedish, and English, and are consequently not handicapped like students in many similar colleges where one system only is taught. The instruction is both practical and

number or individual students attending the more important classes in this section :—

Advanced Electrical Engineering ...	58
Elementary Electrical Engineering ...	55
Alternating and Polyphase Currents ...	24
Calculus for Electrical Engineers ...	21
Electric Wiring and Fitting ...	69
B.Sc. Physics for London University ...	20
Telegraphy ...	14

The equipment of the laboratories for this work contains some interesting apparatus and machines. The polyphase generator, which consists of three small alternators of identical construction mounted on one bed plate and coupled together with graduated couplings, which admit of any given phase difference being produced between any of the alternators, deserves particular mention. There are also examples of the most recent continental three-phase and induction motors, on which careful tests

are now being made. There is an ingenious combination of motor generators, which can be driven either mechanically or electrically. The switchboard and starting appliances for this combination of motor generators were designed and made in the institute.

A small workshop, with electrically driven tools, affords a good scope for the construction of original apparatus. Only typical instruments and standards have been purchased for the physical and electrical laboratories; the great bulk of the instruments and fittings have been both designed and made up in the polytechnic itself. Among the more recent pieces of original apparatus of home manufacture may be mentioned (1) a modified form of Michelson's interferometer, and another adaptation of the same for measuring to a millionth of an inch, and (2) an electro-magnetic speed indicator for use with dynamos and motors. Examples of original apparatus made at the South-Western Polytechnic have been exhibited at the Royal Society, the Royal Institution, and the Institution of Civil Engineers.

Good research work has been accomplished, including a series of tests on insulating materials, investigations on selenium cells, the effects of repeated heating and cooling on the magnetic properties of wrought iron, the relation between the thickness of metallic surfaces and the phase change of the reflected beam, tests with the Nernst lamp, and the negative resistance offered by certain metallic oxides. The results in the last piece of work have been published in the *Electrician*.

OTHER POINTS OF INTEREST.

Several general considerations must be taken into account before the educational position of the South-Western Polytechnic can be rightly estimated. The recreative side of the polytechnic is not considered of prime importance, and the tendency seems to be to minimise its influence. In this respect it departs somewhat from the general type of polytechnic in the metropolis. There is also a laudable desire to initiate new departments as the need for them becomes evident, so that the institution may keep in touch with all the needs of the inhabitants in its neighbourhood. In this connection may be cited the work now being done on the women's side of the institute in the direction of offering ladies of the middle classes such instruction in domestic science as will make them independent of servants. Finally, it should be borne in mind that in more than one department the work being done is of quite as advanced a character as that in some university colleges.

A. T. SIMMONS.

PRIZE LIST OF THE PARIS ACADEMY OF SCIENCES.

AT the Annual Meeting of the Academy, held on December 18, M. von Tiegheim gave his Presidential Address, and announced the prizes awarded for 1899. In his address, the President reviewed the scientific progress for the year, and then gave a short account of the life-work of the Members, Foreign Associates, and Correspondents who have died during the past year, MM. Naudin, Friedel, Frankland, Bunsen, Richards, Wiedemann, Marsh, Flower, and Riggenbach.

The prizes were awarded as follows: in Geometry—the Bordin Prize is not awarded, but M. Jules Drach receives an honourable mention, the Francœur Prize to M. Le Cordier, with an honourable mention to M. Le Roy, the Poncelet Prize to M. Cosserat, for the whole of his contributions to geometry and mechanics.

In Mechanics: the Extraordinary Prize of 6,000 francs to M. Bailles for his treatise on the Geometry of indicator diagrams, MM. Charbonnier and Galy-Aché, and Perrin, receiving supplementary prizes, the Montyon Prize to M. Partiot, the Plumey Prize to M. Bonjour for his inventions in connection with steam engines, and the Fournayon Prize to M. A. Rateau for his theoretical and experimental researches on the theory of pumps.

In Astronomy: the Lalande Prize is awarded to Mr. W. R. Brooks for his important discoveries in connection with comets, and the Valz Prize to M. Nyrén, of Pulkova, for his work in sidereal astronomy.

In Physics: M. Blondlot receives the La Caze Prize for the whole of his researches in experimental physics.

In Statistics: the Montyon Prize is divided equally between the Office central des Œuvres de Bienfaisance, for the memoirs

entitled "La France Charitable" and "Paris Charitable," and MM. Dumesnil and Mangenot, for a complete economic study of the trades, income, and mode of living of the inhabitants of Pointe d'Ivry.

In Chemistry: the Jecker Prize is given to M. Maurice Hanriot for the whole of his contributions to organic chemistry, the Wilde Prize to Dr. P. Zeeman for his important discoveries of the relations between the magnetic field and the nature and polarisation of light rays, and the La Caze Prize to M. Engel.

In Mineralogy and Geology: the Delesse Prize is awarded to M. Kilian for his studies in the French Alps, and the Fontanne Prize to M. Émile Haug for his palæontological studies.

In Botany: M. l'Abbé Hue receives the Desmazières Prize for his work on the anatomy and classification of the Lichens, M. Leuduger-Fortmorel an honorable mention for his memoir on the diatoms of the East Coast of Africa, MM. Jules Cardot and Hériband Joseph Montagne Prizes, the Thore Prize being divided between MM. Parmentier and Bouilhac.

In Anatomy and Zoology: the Grand Prize of the Physical Sciences is not awarded; the Bordin Prize is accorded to M. Viré for his memoir on the subterranean fauna of France, and the Savigny Prize to M. Guillaume Grandidier for his researches in Madagascar.

In Medicine and Surgery: Montyon Prizes are given to MM. Nocard and Leclainche for their book on microbial diseases, to Prof. Mayet for his "Treatise on Medical Diagnosis," and to M. A. B. Marfan for his work on the treatment and feeding of young infants. MM. Lejars, Fournier and Garnier receive mentions, and MM. Guillemonat and Labbé citations. The Barbier Prize is divided between MM. Houdas and Joannin, Lapique, and Schlagdenhauffen. Since no work has been received meriting the Bréant Prize for cure or treatment of Asiatic cholera, the Commission has decided to divide the sum accumulated (6000 francs) between M. Vaillard, and MM. Courmont and Doyon for important work on the pathology and pathology of tetanus, MM. H. de Brun, Ch. Besnoit, and J. Guillé receiving mentions. The Godard Prize is awarded to M. Pasteau, the Serres Prize to M. Roule, with honourable mention to Prof. J. Beard, M. Maurice Caullery, and M. Félix Mesnil, the Chaussier Prize to M. Charrin, the Mège Prize to MM. Félix Terrier and Marcel Baudoin for their memoir on intestinal suture, the Baron Larrey Prize to MM. Arnaud and Lefeuvre for their memoir on Tuberculosis in the Army, the Bellion Prize being divided between M. Cestan and MM. Crespin and Sergeant.

In Physiology: the Montyon Prize for Experimental Physiology is given to Prof. Le Hello for his studies on the locomotion of the horse, M. Quinton receiving honourable mention, the La Caze Prize (Physiology) to Prof. Morat for his contributions to Experimental Physiology, and the Pourat Prize to MM. Weiss and Carvalho for their paper on the specific characters of muscular contraction in the animal series, the Philipeaux Prize not being awarded this year. In Physical Geography, M. Albert Vayssière receives the Gay Prize.

Of the General Prizes, the Arago Medal was awarded to Sir G. G. Stokes on the occasion of his jubilee at Cambridge. The Montyon Prize (unhealthy trades) is given to M. E. Collin for his memoir on the microscopy of foods of vegetable origin, M. P. Razous receiving a mention. M. Louis Ducos de Hauron is awarded the Trémont Prize for his invention of photography in colours by the method of superposed coloured images, M. Vaschy, the Gegner Prize, M. Moutard, the Petit D'Ormy Prize (Mathematics), M. Alfred Giard, the Petit D'Ormy Prize (Natural Sciences), M. Verbeck, the Tchihatchef Prize, M. Maurice Leblanc, the Gaston Planté Prize, M. René Metzner, the Cahours Prize, M. Lecaillon, the Saintour Prize, the Pasteur Institute, the Jean-Jacques Berger Prize, M. J. P. Siegler, the Prize founded by Mme. la Marquise De Laplace, the Prize founded by M. Félix Rivot being divided between MM. Siegler, Heurteau, Aron, and Becquerel.

RESULTS OF RECENT SOUNDINGS IN THE PACIFIC.¹

CAPT. MOSER and I decided not to make any soundings nor do any deep-sea work until we had passed beyond the lines of soundings already run by the *Albatross* and *Thetis* between California and the Hawaiian Islands.

¹ Abridged from a letter received by the U.S. Fish Commission from Prof. Alexander Agassiz, and published in *Science* of December 8.